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ABSTRACT

This guide was developed as part of a curriculum research project designed to improve the teaching/learning process for industrial arts education in North Dakota secondary schools and to restructure subject matter into the cluster areas for efficient teaching and delivery. The guide is intended to assist industrial arts teachers in developing planned programs and courses (at the junior high school or level one phase of industrial arts) that reflect concepts related to industry and technology. It outlines the rationale and objectives for the program, content, student competencies to be developed, student learning activities, and instructional resources for each of five cluster areas. The five cluster areas included are insights into industry and technology, graphic communication, manufacturing, construction, and energy and power. Samples are included of the units and of student competencies and activity sheets in outline form listing the rationale, unit objectives, cluster area knowledge structure, and instructional resources needed to teach the unit. The appendix contains materials used in conducting the curriculum guide rewriting project. (TA)

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Research Series No. 55.

Final Report

Industrial Arts Curriculum Guide - Level I for North Dakota Secondary Schools Using The Cluster Technologies Approach

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In Cooperation with
North Dakota State Board
For Vocational & Technical Education
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PREFACE

Concern for the curriculum of our schools promotes us all to continually seek ways to assess "what is" and identify ways to improve the educational activities and experiences now provided. Recognition of the need by many practitioners to strengthen the schools' efforts to develop the students' understanding of the technological environment prompted the development of this curriculum guide for industrial arts.

The early involvement and commitment of representatives of the North Dakota Industrial Arts Association and teacher educators in the development of this guide must be recognized as one of its major strengths. The continued involvement of those practitioners has contributed much to provide the type of information and direction that is of assistance to industrial arts teachers who are designing and implementing curricular experiences related to industry and technology.

A curriculum committee, which was composed of representatives from school divisions across the state, developed the guide over a two-year period beginning in 1975. During this time the committee obtained considerable direction from recent research findings and curriculum concepts in industrial arts from a national basis.

Designed as a directional device for the secondary school industrial arts program, the guide provides specific direction to the broad exploration, content courses in industrial arts.

The educational experiences proposed in each of the five exploratory cluster areas offer rich opportunities for students to become acquainted with their industrial technological culture. The format and content is

uniquely helpful in providing information to industrial arts teachers of the learning process as they search for ways to assure that the career development and technological literacy goals are incorporated in the educational program.

RCU PROJECT DIRECTOR
Myron Bender

"The goal of education is the continuous cultivation of the abilities to make wise decisions and execute them effectively, in all behavioral areas throughout the life of a person."

--Asahel D. Woodruff

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ABSTRACT

This RCU curriculum research project was part of a long-range plan to improve the teaching/learning process for industrial arts education in North Dakota secondary schools. The primary overall attempt was to restructure subject matter into the cluster areas for efficient teaching and delivery system.

During the past few years, the North Dakota industrial arts personnel have been heavily engaged in various projects in an attempt to re-design instructional strategies and content organizers for industrial arts. Their interest in curriculum re-design was kindled in some instance by the availability of funds to support innovations. Nevertheless, all of the approaches addressed the charge of educational improvement in industrial arts and relevancy of subject matter content and student learning activities.

Through a series of EPDA workshops and/or in-service courses conducted during the past two years, industrial arts teachers have recognized the need to change. Consequently, many have become interested and committed to the need for re-designing industrial arts programs for secondary schools in North Dakota. It is therefore important to continue our efforts so that we don't lose the interest created up to this point in time.

This project was a continuation or part of a "Master Plan" that was outlined in 1974 for North Dakota industrial arts. The total master plan included various specific phases: (1) development of a suggested Master Plan for industrial arts. completed in 1975; (2) development of instructional materials, completed in 1976; (3) implementation through pilot project during 1976-77 academic year; (4) research and develop a final copy of an industrial arts curriculum guide using the Cluster Technologies Approach.

In addition, there has been and will continue to be an on-going inservice teacher education program to aid in the total implementation phase.

It was evident for change to come about, industrial arts teachers had to develop a curriculum guide that outlined the: (1) rationale and objectives; (2) content; (3) student competencies to be developed; (4) student learning activities; and (5) instructional resources for each of five cluster areas.

The five cluster areas included: (1) Insights into Industry and Technology; (2) Graphic Communication Technology; (3) Manufacturing Technology; (4) Construction Technology; and (5) Energy and Power Technology.

The curriculum guide developed was for the level one, traditional to be implemented at grades 7, 8 and 9.

METHOD AND PROCEDURE

The general design for the curriculum project was primarily a study and writing group process. The nucleus of the project consisted of five distinct parts: (1) organizational; (2) evaluation of pilot projects; (3) analysis and synthesis of data collected; (4) writing session; and (5) printing and distribution of completed curriculum guide.

The organizational phase included the formulation of a structure and the identification of participants. Essentially the organizational phase called for the development of an organizational structure that would actively involve secondary school classroom teachers in the development of the curriculum guide.

Ten junior and senior high school industrial arts teachers were selected to serve as the investigative and writing team. They were selected on the basis of teaching experience and expertise or competencies in one of the five cluster areas. In addition, five teacher educators were selected to serve as consultants for the project. They too were selected on the basis of their competencies in one of the five cluster areas and their duties were to monitor the small group sessions.

Another criterion used in the selection of the secondary school teachers was that at least one member for each of the five cluster areas, had been previously involved in one of the 1976-77 industrial arts pilot projects that were conducted in the State. Consequently, first hand information was available to each small group on the results of the school who field tested some preliminary curricula materials the previous year.

The evaluation phase included the design of a survey instrument for the purpose of surveying thirty-six secondary school industrial arts

teachers that had been exposed or used the preliminary curriculum materials that were being field-tested during the 1976-77 academic school term. This provided first-hand information to the writing team for those activities that work and to determine changes to be made.

The Analysis/synthesis phase included the analysis of the data collected through the survey instrument mentioned in phase two. The writing team also had access to the final reports that were submitted to the State Industrial Arts Supervisors Office on the five funded pilot projects. This information was extremely valuable in the development of the final format for the curriculum guide that was under development.

Phase four -- writing session consisted of a three day actual writing the level-one curriculum guide. The fifteen participants worked in large and small groups to complete the objectives of the project from format to be used to the preparation of the final copy.

The last phase consisted of the editing, printing and distribution of the completed guide. Five hundred copies were printed in the Department of Industrial Technology at the University of North Dakota. Copies were distributed to all schools having industrial arts programs in the State of North Dakota.

FINDINGS AND ANALYSIS

Introduction

The problem of developing a rational basis for curriculum development is crucial for two reasons: (1) the ferment in education has caused educators to be confused about the criteria by which to decide what the content of curriculum should be and the ways in which learning should be organized, and (2) the explosion of knowledge has made the simplicity

of industrial arts subjects impossible. As specialized knowledge increases, it is necessary to either add more courses or to clusterize knowledge for effective delivery.

The curriculum consists of two different things, the content and the learning act. These two things are in constant interaction with each other. It is possible to deal with significant content in a manner that results in inadequate learning, or to apply effective learning processes to content that is in itself not worth knowing.

Subject matter without suggested learning activities caused sterility. Content must be selected on the mental operations employed while learning it. As we develop the objectives for a curriculum, it is essential to remember the importance of learning activities. The attainment of objectives is not based on the acquisition of knowledge alone but also through the promotion of critical thinking and the opportunity to practice the desired behavior.

The Development of the Guide

There were a number of events that led up to the actual development of the Level I curriculum guide. It was in 1975 when a group of classroom teachers were selected to form a committee to develop a "Suggested Master Plan for Industrial Arts in North Dakota." This committee identified the basic curriculum structure that became the basis for the development of a guide.

A second phase included a series of workshops entitled, "Essential Techniques for the Development of Industrial Arts Classroom Instructional Materials" (EPDA - 008 - 76). The primary purpose of this phase was to equip classroom teachers with the essential tools necessary in writing curriculum materials. Upon the completion of phase two, fourteen class-

room teachers plus five teacher educators (consultants) were selected to participate in the next phase.

The third phase included the review of existing curriculum materials, the development of a format, and the actual writing of a rough draft copy curriculum guide (RCU Project - 1976). The purpose of the draft copy was to provide the opportunity to field test the materials that were developed prior to full implementation.

Phase four involved the selection of eight schools that would serve as pilot programs to field test the preliminary materials prepared during phase three. The schools selected represented three different size enrollments from low to high. This was essential to ensure that the preliminary materials were implemented at a realistic representation of high schools in North Dakota.

The fifth or last phase was to equate the results of the pilot projects and to make the necessary changes prior to the development of the final copy of the Level I curriculum guide.

The Problem

Research, design and develop an Industrial Arts Curriculum Guide -- Level I (recommended grades 7th, 8th and 9th) for North Dakota secondary schools. The specific objectives for the project were:

1. To review, analyze, and synthesize the evaluation reports from eight pilot projects that had been conducted in North Dakota secondary schools during the 1976-77 Academic School Term. The reports prepared summarized the successes and failures of activities, identified in an earlier RCU Project - 1976, when having been field tested.

2. To develop a final format as a guide for the development of the State Curriculum Guide.
3. To prepare six sections to be included in the guide:
   a) Introduction section
   b) Insights into Industry & Technology
   c) Graphic Communications
   d) Manufacturing
   e) Construction
   f) Energy/power
4. To dissiminate the completed guide to every secondary school in North Dakota having industrial arts programs.

Fundamental Curriculum Issues

Many of the issues of industrial arts education today are complex and by their presence command the attention of everyone in the profession. The fundamental questions that must be answered in developing a curriculum:

1. What should be the educational objectives of the curriculum?
2. What learning experiences should be developed to enable students to achieve the objectives?
3. How should the learning experiences be organized to increase their cumulative effects?
4. How should the effectiveness of the curriculum be evaluated?

Before one can answer the above questions, one must consider what content is to comprise the curriculum. The industrial arts teacher must be especially alert to change in content due to technological advances in both industry and education. He or she has a professional obligation to keep up with technical advances in industry/technology and to translate the appropriate technology into a classroom-laboratory instructional

program.

There is one fundamental premise in curriculum development. If it is to be effective, the development must involve those who ultimately put the plan into action. Naturally, not everyone can be directly involved in the development of a state curriculum guide; however, inservice education programs and conferences that encourage teachers to reflect on where they are and where they are going must be encouraged.

The Curriculum Preliminaries

The initial step in curriculum development for industrial arts was to establish a firm basis for a total integrated program. The elements involved are: (1) philosophical rationale and goals; (2) program scope and sequence; and (3) learning activities and concomitant outcomes.

Philosophical Rationale and Program Goals

The case of any educational endeavor rests ultimately with the validity of certain basic assumptions. In the case of industrial arts, it is assumed that it is worthwhile for human beings to understand and be able to manage their environment.

Those elements which compose the physical environment which all human beings share can be divided into two general classes--natural and people-made. Study of the natural environment has a well-established place in the school science programs. The study of the people-made physical environment, which in the broadest sense, is a study of technology is seemingly of equal importance but its significance as total education and hence a part of the overall school curriculum has only recently begun to be understood.

Industrial arts is an organization of experiences designed to assist

in the formation of concepts and development of insights into technology. These experiences are intended to have the learner participate actively in the conceiving, designing, planning and producing goods, using materials common to daily life. The learner is exposed to activities for:

A. experiencing industrial technology
   -- through planning, designing, experimenting, constructing, and operation using ideas, materials, tools, processes, products, and energies;

B. learning about industry and technology
   -- their origin, development, advance, and impact on man, environment and culture;
   -- their technical, social, economic, occupational, cultural, recreational nature, influences, and outcomes;
   -- their consequences for the individual as a citizen, consumer, and worker.

Clear and realistic goals are essential in providing a sound industrial arts program for all students. The unique contribution of an industrial arts program focus on providing students with an opportunity to:

1. Develop an insight and understanding of industry, its place in our society, and the free enterprise system.
2. Discover and develop individual talents, aptitudes, interests, and potentials as related to industry and technology.
3. Develop an understanding of industrial processes and the practical application of scientific principles.
4. Develop problem-solving and creative abilities involving the materials, processes, and products of industry.
5. Develop an understanding of industrial and technological career opportunities and their requirements and develop those traits

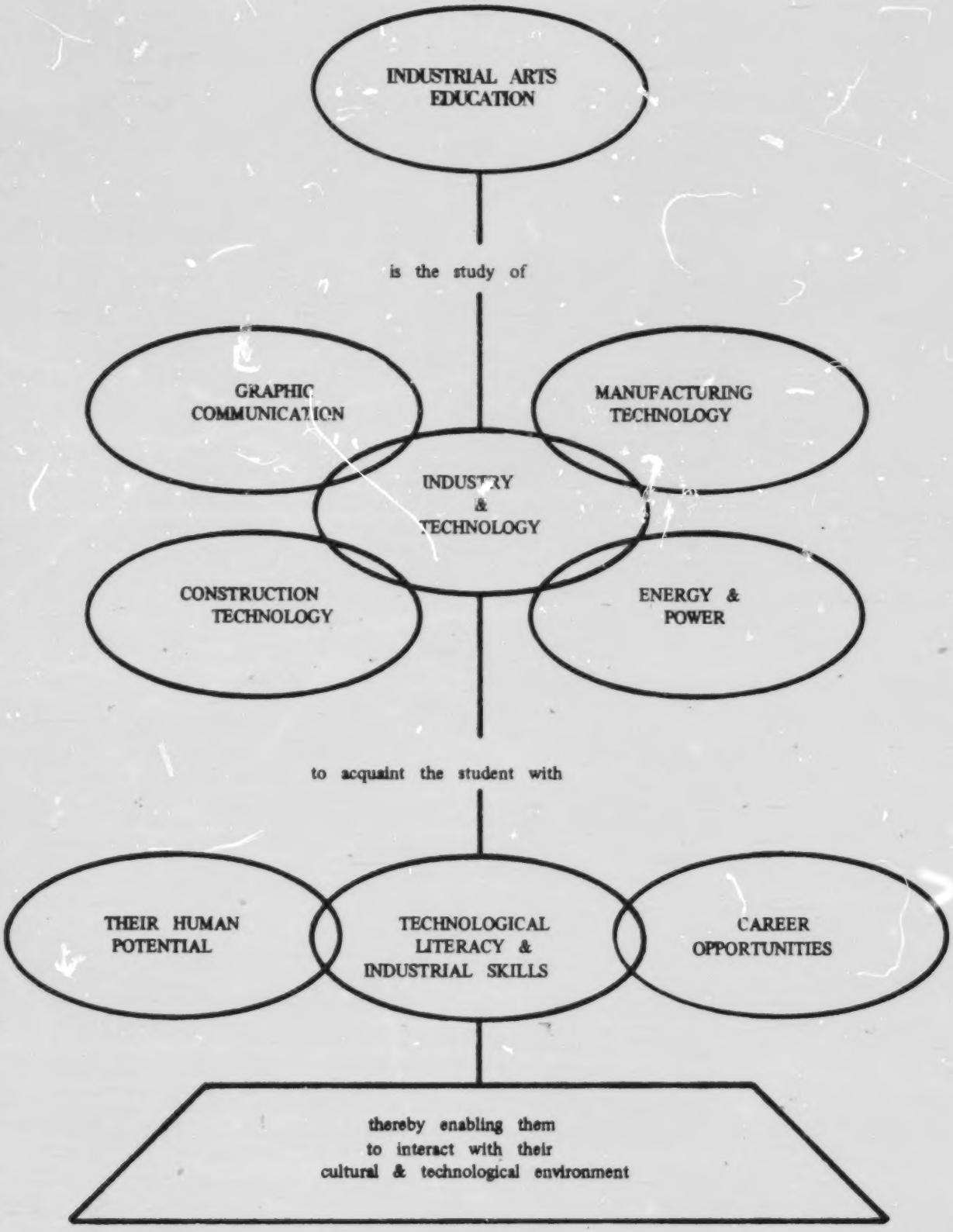

INDUSTRIAL ARTS EDUCATION
is the study of
GRAPHIC COMMUNICATION
MANUFACTURING TECHNOLOGY
INDUSTRY & TECHNOLOGY
CONSTRUCTION TECHNOLOGY
ENERGY & POWER
to acquaint the student with
THEIR HUMAN POTENTIAL
TECHNOLOGICAL LITERACY & INDUSTRIAL SKILLS
CAREER OPPORTUNITIES
thereby enabling them to interact with their cultural & technological environment

Figure 1

which will help students obtain and maintain employment.

Program Scope and Sequence

Industrial arts education involves the preparation, growth, and guidance of the individual student for modern living through an instructional program including the technical, consumer, occupational, recreational, organization, social, historical and cultural aspects of industry and technology. The industrial arts program provides opportunities for students in elementary and secondary education to develop an understanding of industrial-technical knowledge through creative and problem-solving learning experiences.

The purpose of this guide is to assist the industrial arts teacher in the development of planned programs and courses that reflects the changing philosophy and practices in industrial arts education as well as incorporating the effects of technological changes. It is hoped that industrial arts teachers will use this guide as a basis for planning level one exploratory courses that reflect concepts related to industry and technology.

The guide provides a broad framework from which individual industrial arts programs and courses are developed at the local level. The learning experiences identified involve activities in experimenting, planning, designing, constructing, evaluating, and using tools, machines, materials, and processes. While industrial arts utilizes and motivates universal learning experiences, its scope and sequence of courses have a direct relationship to vocational education as well as career education concepts. The instructional and laboratory experiences provide students with knowledge to help them to make wise educational occupational choices.

Scope of Industrial Arts Programs--To understand the direction of industrial arts, while recognizing the interrelations of the programs, it

becomes necessary to divide the total program into operational levels--the elementary, junior high (exploratory-level one) and high school (specialization-level two). (See figure 2).

Elementary School Industrial Arts Program

The focus of the program is to develop an awareness of our industrial-technical society. It assists youth in living and participating in a technological society by providing an introduction to the world of work. The instruction should concern itself with the many kinds of work that people do, and the interrelationship of such works to the production and consumption of goods and services.

The elementary school industrial arts program serves: (a) to support and enrich the general educational experiences and make it more meaningful to youth; (b) to develop an awareness of the role of industry in a technological society; (c) to develop awareness of industrial related careers and their role in society; (d) to develop attitudes of cooperation and self-reliance through problem solving situations; and (e) to develop basic skills in working with hand tools and basic materials.

Junior High School--Level One--Program

The primary focus is to meet the needs of the early adolescent student. Early adolescence is a critical time in human development. During this time the student is seeking independence, sensitive to peer acceptance, establishing a value system and expanding his intellectual ability and experiences.

This operational level is divided into two parts: (1) Orientation; and (2) Exploration. The first course recommended is an orientation to industry and technology. Emphasis is placed on the "whole" of industry

and technology and its effects on man, society and the environment. This course serves as the foundation to illustrate the complexity of industry and the interrelationships of its various elements in regards to types of industries, the organization and operation of industry.

The exploratory cluster courses include: (1) graphic communication; (2) manufacturing; (3) construction; and (4) energy and power. Special concerns for the exploratory cluster courses are the common learnings needed by all persons to function effectively in an industrial-technological society.

This phase is activity oriented through planned learning experiences in each of the four technical cluster areas. The activities assist the learner in developing proper attitudes, abilities and skills, problem solving, and understanding the world of work.

As a result of the sequence of industrial arts experiences at the junior high school or operational level one, the learner: exhibits a degree of industrial/technological literacy--insights and knowledge--in being able to relate societal and industrial changes to technology and its development; has made tentative choices or selection regarding educational and occupational goals; can identify and compare industrial and technical occupations, the organization of industry, evolving technologies, and methods of production; demonstrates the proper use of tools and materials; can apply, demonstrate and exhibit industrial processes and techniques through laboratory experiences and projects.

Senior High School--Level Two--Program

Industrial arts at the senior high school provides concentrated and specialized technical courses. The key to the level two program lies in its flexibility. Students at this level evince a wide range of interests,

NORTH DAKOTA INDUSTRIAL ARTS CURRICULUM

Program Scope and Sequence Model

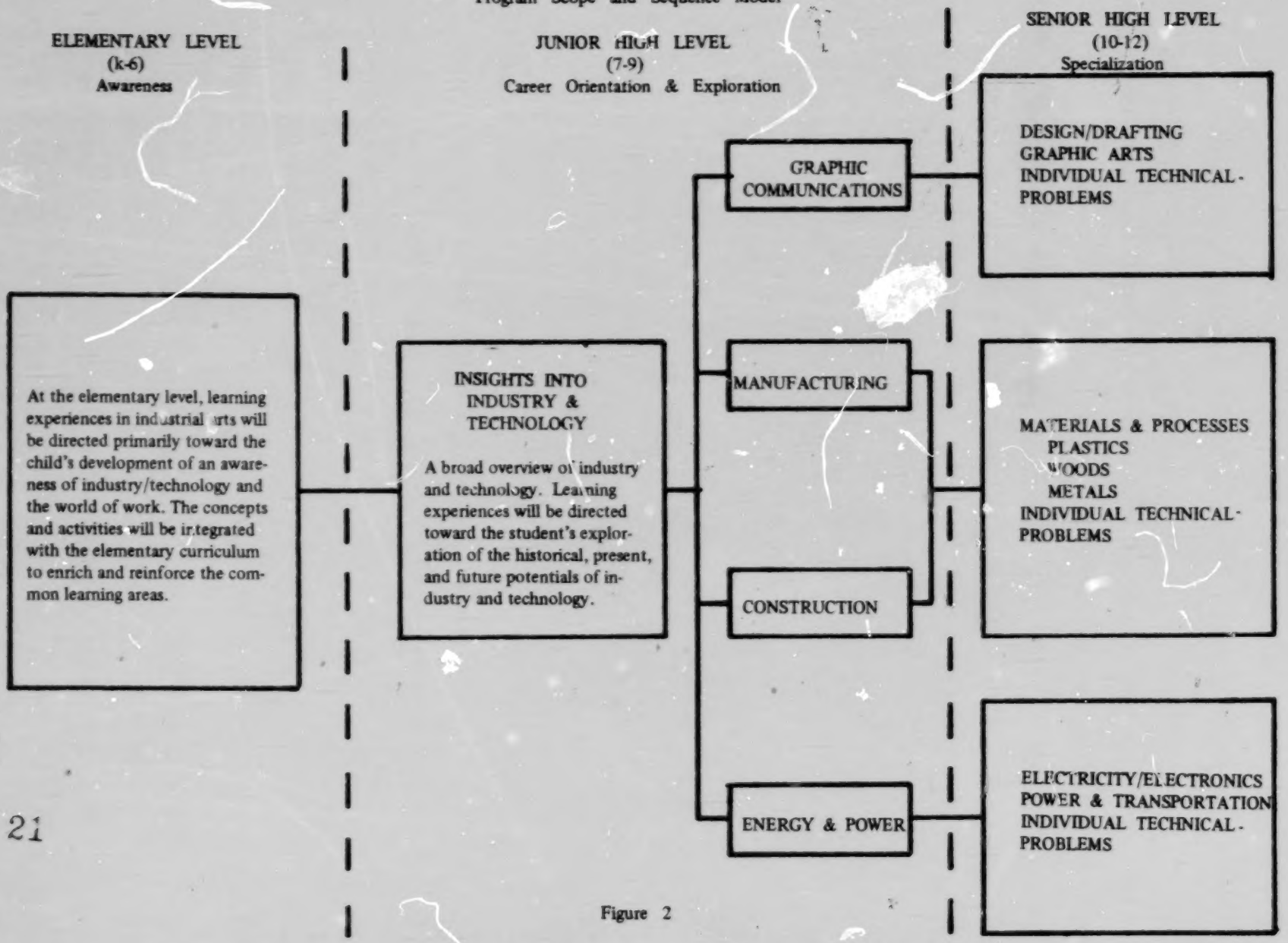

ELEMENTARY LEVEL
(k-6)
Awareness
JUNIOR HIGH LEVEL
(7-9)
Career Orientation & Exploration
SENIOR HIGH LEVEL
(10-12)
Specialization
At the elementary level, learning experiences in industrial arts will be directed primarily toward the child's development of an awareness of industry/technology and the world of work. The concepts and activities will be integrated with the elementary curriculum to enrich and reinforce the common learning areas.
INSIGHTS INTO INDUSTRY & TECHNOLOGY
A broad overview of industry and technology. Learning experiences will be directed toward the student's exploration of the historical, present, and future potentials of industry and technology.
GRAPHIC COMMUNICATIONS
MANUFACTURING
CONSTRUCTION
ENERGY & POWER
DESIGN/DRAFTING
GRAPHIC ARTS
INDIVIDUAL TECHNICAL-PROBLEMS
MATERIALS & PROCESSES
PLASTICS
WOODS
METALS
INDIVIDUAL TECHNICAL-PROBLEMS
ELECTRICITY/ELECTRONICS
POWER & TRANSPORTATION
INDIVIDUAL TECHNICAL-PROBLEMS

Figure 2

abilities, and life goals. The industrial arts program must provide separate courses or instruction within courses that will provide the option of exploring industrial areas based on student interest or need.

In these courses, not all students may study the same depth or type of content. Courses and content may be selected individually for those who may leave school before graduation, graduate, or enroll in secondary or post-secondary vocational programs.

Learning Activities and Experiences

Learning Experiences in Industrial Arts Will . . .

. . .Provide opportunities to identify aptitudes, abilities, and interests meaningful to CAREER SELECTION.

The student can identify and differentiate various occupations and professions associated with technology.

Student Activities:

Mass Production
Field Trips
Role Playing
Custom Production
Personnel Organization
Personal Assessment

. . .Promote TECHNOLOGICAL LITERACY in youth and adults.

The student demonstrates technical literacy, insight, and knowledge that are essential for living and functioning successfully in a rapidly advancing technological society.

Student Activities:

Using tools and materials of industry
Identifying processes required to produce constructed and manufactured products
Recognizing and evaluating quality of design, materials, and workmanship
Reading, researching, and reporting information in the technical literature

. . .Develop Techniques in PROBLEM SOLVING.

The student demonstrates his problem solving abilities through problem analysis, ideation, prototype development, testing, and technical reporting.

Student Activities:

Technical reports
Planning and constructing projects
Individual and team activities
Design problems
Research and development
Simulating industrial techniques and processes
Brainstorming
Prototype developing and testing

. . .Develop basic SKILL in the use of tools, machines, and materials.

The student can properly use and care for common tools and machines.

Student Activities:

Using hand and power tools and equipment
Construction activities
Custom production
Mass production

. . .Develop attitudes, individual involvement, and a realistic evaluation for CONSUMER AWARENESS.

The student evaluates industrial products by judging the quality of construction, the selection of materials, and the fulfillment of function.

Student Activities:

Product evaluation
Testing limits of materials
Research including design and drawing
Understanding advertising
Applying and evaluating finishes
Fabricating and assembling products
Exploring industrial processes

. . .Provide opportunities for PERSONAL and SOCIAL GROWTH.

The student exhibits cooperation, consideration, and understanding toward others, and pride for his/her own work.

Student Activities:

Mass production
Club activities

Amateur radio
Personnel organization
Civic activities

. . .Provide opportunities for REINFORCEMENT of learning in other subject areas.

The student solves practical problems by the application of academic concepts and principles.

Student Activities:

Research information and planning
Performing experiments
Using related instructional materials
Developing related organization practices
Reading, writing, measuring, computing, and discussing during technical applications

. . .Develop SAFETY habits.

The student exhibits safe practices in the laboratory and relates these to situations in the school, home, and community.

Student Activities:

Laboratory safety program
Safety committees
Self-evaluation
Safety practices

. . .Contribute to improve RECREATION.

The student, through laboratory experiences with tools and materials, makes choices of activities for recreational purposes.

Student Activities:

Crafts
Metal working
Photography
Mechanics
Plastics
Electronics

Format of Level I Curriculum Guide

The guide developed was for the junior high school or level one phase of industrial arts. It was designed to provide school district

personnel and industrial arts instructors with a recommended curriculum structure for the exploratory level of industrial arts education. It should be complemented by local teachers with specific instructional materials, lesson plans, assignment sheets and other instructional resources to enhance the teaching/learning process.

The overall format of the level one industrial arts curriculum guide was divided into six parts:

1. Introduction to the level one curriculum.
2. Introductory course--Insights into Industry and Technology.
3. Graphic Communication.
4. Manufacturing.
5. Construction.
6. Energy/Power.

Part 1 was provided to assist teachers in establishing industrial arts programs. It provided the rationale and objectives of industrial arts education. The content may be used to establish a firm basis for the total program. The curriculum organization follows the school operational levels of elementary, junior high, and senior high school in order to more effectively meet the needs of these subgroups.

The parts 2 through 5 provided the guidelines for actual courses to be offered at the exploratory level only. Each part provided the basic foundation to develop a one semester course based on the cluster concept. The cluster approach was suggested for study of interrelated careers and technologies in the industrial segment of life.

A working description of the five clusters recommended for industrial arts were:

1. Insights Into Industry and Technology--a course that provides an overview of industry and technology. It serves as an

intergrator or unifier of industry and technology as a "whole" rather than fragmented parts. Emphasis is on the discipline of industrial technology in regards to the role of industry, materials, personnel, production, processes, energy, management, distribution, and occupational information.

2. Graphic Communication--an area of study involving techniques and processes used to transmit ideas, knowledge, or information. Emphasis will be to provide exploratory laboratory and classroom activities in the areas of drafting and graphic arts.
3. Manufacturing--an area of study involving techniques and processes used to produce goods. It involves research, locating and securing materials, processing of materials into finished products that will be of value to society.
4. Construction--an area of study in the development and building of a product to be assembled on site. Emphasis will be on pre-construction, construction, and post-construction including the whole spectrum of construction technology from management through construction processes.
5. Energy/Power--an area of study through activity-oriented instruction on energy sources, conversion, transmission and control, and usage in industry, domestic, and transportation.

Format of Each Cluster Area

A uniform format was used for each of the cluster areas in terms of pagination and division of sections for ready reference. The first section was identified by the color of paper and numerical pagination includes the following elements:

- Rationale
- Cluster Objectives
- Guidelines for Implementation
- Taxonometric Structure
- Body of Knowledge
- List of Major Units

Section two for each part identifies recommended instructional units. The number of units vary between parts but the format is the same for all five parts. Specific elements for each unit include:

- Title of Unit
- Unit Objective
- Unit Outline
- Selected Student Competencies and Sample Learning Activities
- Resources

Elements For Each Section

Since industrial arts is a study of industry and technology, educational programs are established to transmit a body of knowledge consisting of the human technological endeavors. These were divided into five sub-sections:

(1) Insights into Industry and Technology

(2) Graphic Communication

(3) Manufacturing Technology

(4) Construction Technology

(5) Energy/Power Technology

Each of the above five sub-sections of the Level I Curriculum Guide included a rationale; objectives for the unit; cluster area knowledge structure; a list of major units; and instructional resources needed to teach the unit. Samples of the units that were developed are as follows:

SUB-SECTION ONE

Insights Into Industry and Technology Cluster

RATIONALE: Human's create social institutions such as industry and

the related technologies which effect their culture. This constitutes the source of subject matter for industrial arts in the human, technical, and culture complexes. The study of all complexes is essential to an understanding of industry and technology. Each must be studied within the context of the others.

A historical and social analysis of human endeavors in various cultures establishes many of the human universal technological endeavors. Human beings in all stages of their technical developments have been builders, communicators, producers, developers, transporters, craftsmen, and organizers. These technical endeavors have become the basis of curriculum content for industrial arts education.

Since industry and technology have become dominant elements in all societies, the citizenry should know what industry is, understand the impact of technology on society, be aware of industrial and related careers, know how to explore with the tools and materials in a safe and logical manner.

This introductory course "Insights into Industry and Technology" provides the framework for the learner to view the "whole" of industry and technology. This is considered a prerequisite to the study of the parts: 1. Graphic Communication, 2. Manufacturing, 3. Construction, and 4. Energy and Power technical cluster areas.

The course also serves as an integrator or unifier for the whole discipline area of industrial technology. In addition to the universal elements of industry and technology, it provides the learner with a perspective of the interrelationships of the four technical cluster areas.

In fact, the success of the cluster system depends upon the unified treatment of this course because the four clusters, while eliminating a

great deal of fragmentation compared to the traditional system, are themselves fragments of a larger whole.

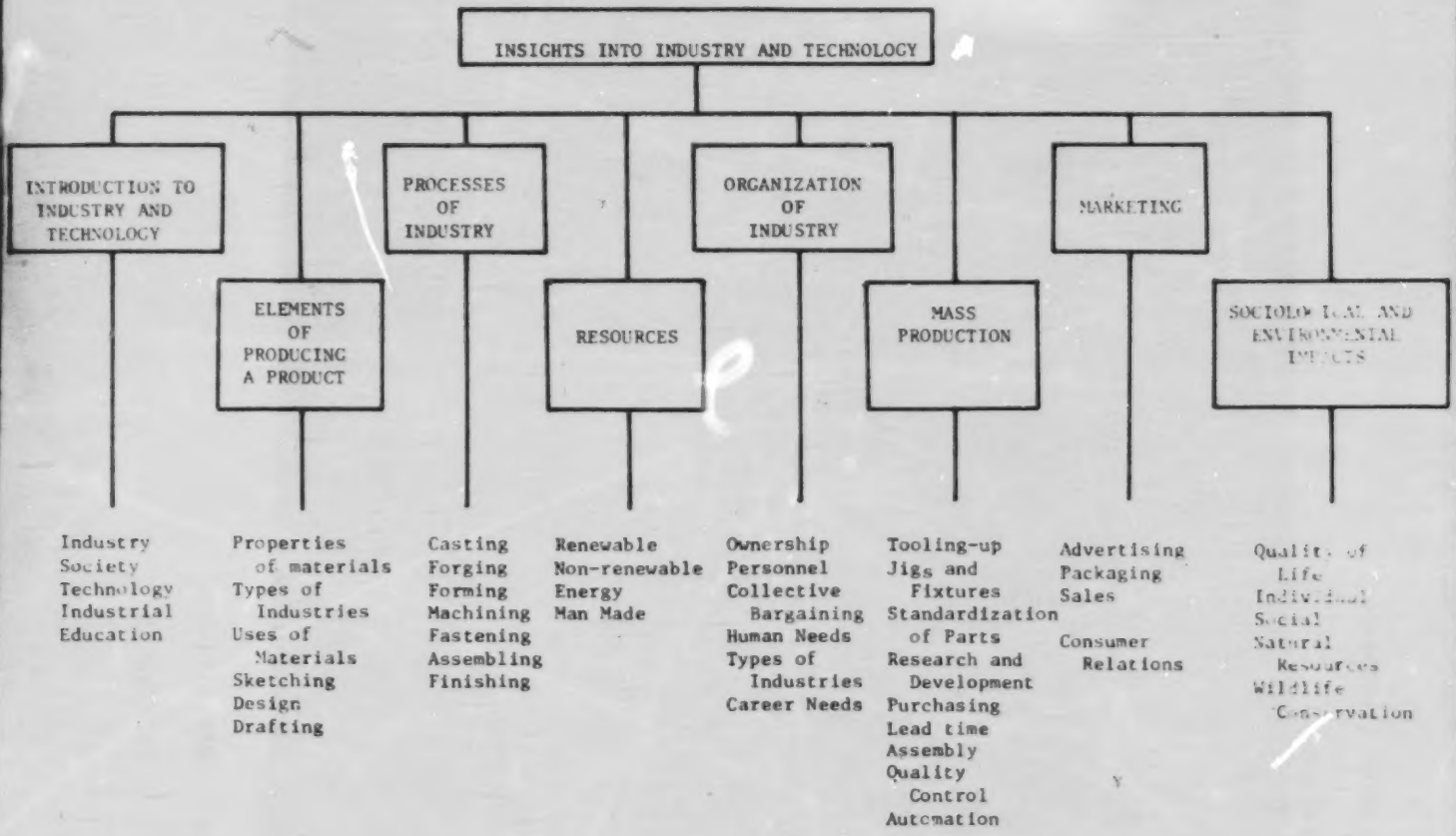
One should also be aware that even though a unified theme is used throughout the course, some units are out of natural sequence to permit a progression of activities from individual to group which is so necessary at this level.

This course is basic to the general education of all pupils even in the absence of further opportunities in industrial arts.

OBJECTIVES: Primary objectives of Insights into Industry and Technology are to assist the student to:

1. A historical perspective into the development and progress of man through the use of tools culminating in a study of modern industry and technology.
2. Develop a concept of what industry is, and provide insights into the relationships that exist between all the common elements of industry and technology.
3. Provide an insight into the relationships that exist between industry and society, which will enable the student to survive and prosper in the resultant environment.
4. Develop an awareness and initiate an exploration of industrial and related careers.
5. Develop abilities in the safe and proper use of industrial tools and materials.
6. Provide an introduction to the study of the four industrial clusters.

TAXONOMETRIC STRUCTURE



Insights Into Industry and Technology Cluster

Preliminary Elements:

RATIONALE 1

OBJECTIVES 2

GUIDELINES FOR IMPLEMENTATION 3

TAXONOMETRIC STRUCTURE 4

BODY OF KNOWLEDGE 5

LIST OF MAJOR UNITS 11

Major Units:

UNIT I INTRODUCTION TO INDUSTRY AND TECHNOLOGY 1.1

UNIT II ELEMENTS OF PRODUCING A PRODUCT 2.1

UNIT III PROCESSES OF INDUSTRY 3.1

UNIT IV RESOURCES 4.1

UNIT V ORGANIZATION OF INDUSTRY 5.1

UNIT VI MASS PRODUCTION 6.1

UNIT VII MARKETING 7.1

UNIT VIII SOCIOLOGICAL AND ENVIRONMENTAL IMPACTS OF INDUSTRY AND TECHNOLOGY 8.1

Resources:

A. - BIBLIOGRAPHY

B. - REFERENCES

UNIT NO. I	SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
1.00	INTRODUCTION TO INDUSTRY AND TECHNOLOGY THE STUDENT WILL BE ABLE TO:	
1.10	A. Orally or in writing define one or more aspects of industry.	A1. Write a report explaining how technology has freed man from drudgery and improved his lifestyle.
1.20	A. Trace orally or in writing the progress of industrial development.	A1. Discuss an analysis of a piece of equipment found in the home in terms of the different technologies and industries needed to produce it. Example: kitchen range, demonstrate bow drill. A2. Initiate a group discussion as to the importance of each major cluster of industries by asking students to imagine life without each one in turn.
1.30	A. Discuss orally or in writing man's dependence on industry using examples he is familiar with.	A1. Students collect newspaper clippings relating to man's dependence on industry, and the affect of industry on man. A2. Discuss local industries A3. Students collect newspaper ads of locally manufactured products.

SUB-SECTION TWO

Graphic Communications Cluster

RATIONALE: Graphic Communications is the process of transmitting visually, ideas, thoughts, or concepts.

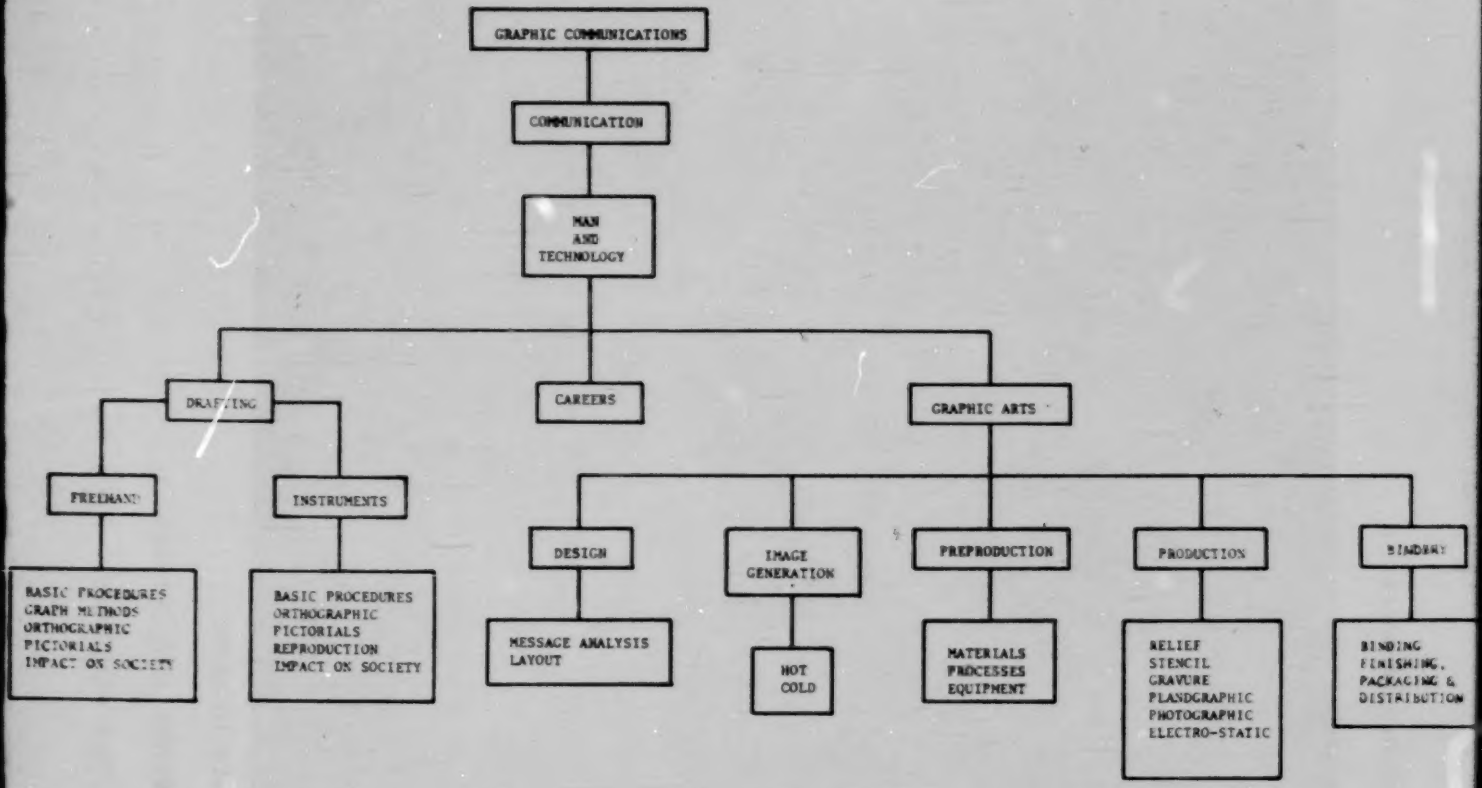
A study of Graphic Communications provides an exploratory experience that develops an awareness and understanding of the drafting and graphic arts industries. It provides opportunities for all students to develop an insight into economic, social and recreational aspects of visual communications in a changing society.

Graphic Communications involves students in meaningful class and instructional activities and develop self-direction, continuous learning, and creativity.

OBJECTIVES: Primary objectives of Graphic Communications are to assist the student to:

1. Develop an insight and understanding of the drafting and graphic arts industry and technology and its place in our society.
2. Develop problem solving and creative abilities using freehand and instrument drafting processes.
3. Discover and develop an insight and understanding of the graphic arts industry through the study of design, image generation, pre-production, production, and bindery.
4. Develop career awareness, exploratory experiences and information dealing with the Graphic Communications industry.
5. Become an effective consumer and/or producer in a Graphic Communications society.

GRAPHIC COMMUNICATIONS
TAXONOMETRIC STRUCTURE



Graphic Communications Cluster

Preliminary Elements:

RATIONALE 1

OBJECTIVES 1

GUIDELINES FOR IMPLEMENTATION 3

TAXONOMETRIC STRUCTURE 5

BODY OF KNOWLEDGE 6

LIST OF MAJOR UNITS 14

Major Units:

UNIT I COMMUNICATIONS 1.1

UNIT II FREEHAND 2.1

UNIT III INSTRUMENTS 3.1

UNIT IV DESIGN 4.1

UNIT V IMAGE GENERATION 5.1

UNIT VI PREPRODUCTION 6.1

UNIT VII PRODUCTION 7.1

UNIT VIII BINDERY 8.1

UNIT IX CAREERS 9.1

Resources:

BIBLIOGRAPHY . . . . . A

VISUAL AIDS SOURCES . . . . . B

OTHER RESOURCES C

SAMPLE STUDENT COMPETENCIES AND ACTIVITY SHEET

UNIT NO. I	SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
1.00	COMMUNICATIONS THE STUDENT WILL BE ABLE TO:	
1.10	A. Describe and compare the advancement of technology and communication	A1. Construct and display methods of communication. Example: telegraph, tin can and string; C-B radio, fiber optics, drums, etc.
	B. Use properly the nomenclature associated with graphic communications.	B1. Construct the origins of alphabets. Example: chart.
	C. Demonstrate effective means of conveying an idea using presentation materials.	C1. Construct communications model in classroom. Example: see transparency.
	D. Apply the theories of visual organization.	
1.20	A. Demonstrate the interrelationship of drafting and graphic arts as used in industry.	A1. Discuss the future of communications. Example: light transmission, laser, satellite.

SUB-SECTION THREE

Manufacturing Technology Cluster

RATIONALE: The concept of manufacturing is defined to include all those activities related to the production of goods and services to meet the wants and needs of man. It is a concept that has been in existence as long as man himself. Even though manufacturing or securing of goods for survival of early man may have been quite simple in modern context, the concept did exist. In this context the concept of manufacturing is fundamental to the existence of man and supported by other related areas.

The concept of manufacturing has three main elements; 1. input which includes an enterprise system, resources and personnel; 2. material processes which includes processing raw material, combining, and finishing; and 3. the output for a needed and desirable product. These elements seemed basic to manufacturing industries with better exception to their complexity.

OBJECTIVES: The objectives of Manufacturing Technology instruction is the study of information and occupations utilizing a variety of materials. It will provide an opportunity for each student to become familiar with the industrial society. The study of the manufacturing industry will help each student understand the nature of work in manufacturing industries. It will include the managed use of tools, materials, and processes needed in the manufacturing phase of industries.

Primary objectives of Manufacturing Technology are to assist the student:

1. To place Manufacturing Technology in the broader context of industrial technology and all of technology.

2. To be aware of the history, present character, and future of the manufacturing phase of industry.
3. To appreciate, understand, and perform selected management practices in planning, organizing, and controlling as they relate to manufacturing production systems.
4. To appreciate, understand, and perform selected personnel practices of hiring, training, working, advancing, and retiring as they relate to a managed production system in manufacturing.
5. To appreciate, understand, and perform selected production practices in pre-processing, processing, and post-processing or servicing as they apply to manufacturing production systems.
6. To appreciate and understand the interrelationships within and between management, personnel, and production practices.
7. To appreciate and have some understanding of characteristics, quality, and use of manufactured products and the tools and materials utilized in their manufacture.
8. To utilize the knowledge and skills of manufacturing management and production to investigate factors involved in the manufacture of representative products.
9. To develop an awareness of vocations in manufacturing industries.
10. To develop responsible and safe work attitudes and the ability to function as a member of a group.
11. To develop an awareness of self-realization and generate self-activating behaviors.

INPUT

1. Level 1 Concept I

   The learner will be able to identify three elements of

manufacturing input.

2. The learner will be able to identify the function of market, resources, product development, for Manufacturing Technology.

PROCESSES

1. Level 1 Concept II

   The learner will be able to identify three elements of manufacturing processes.

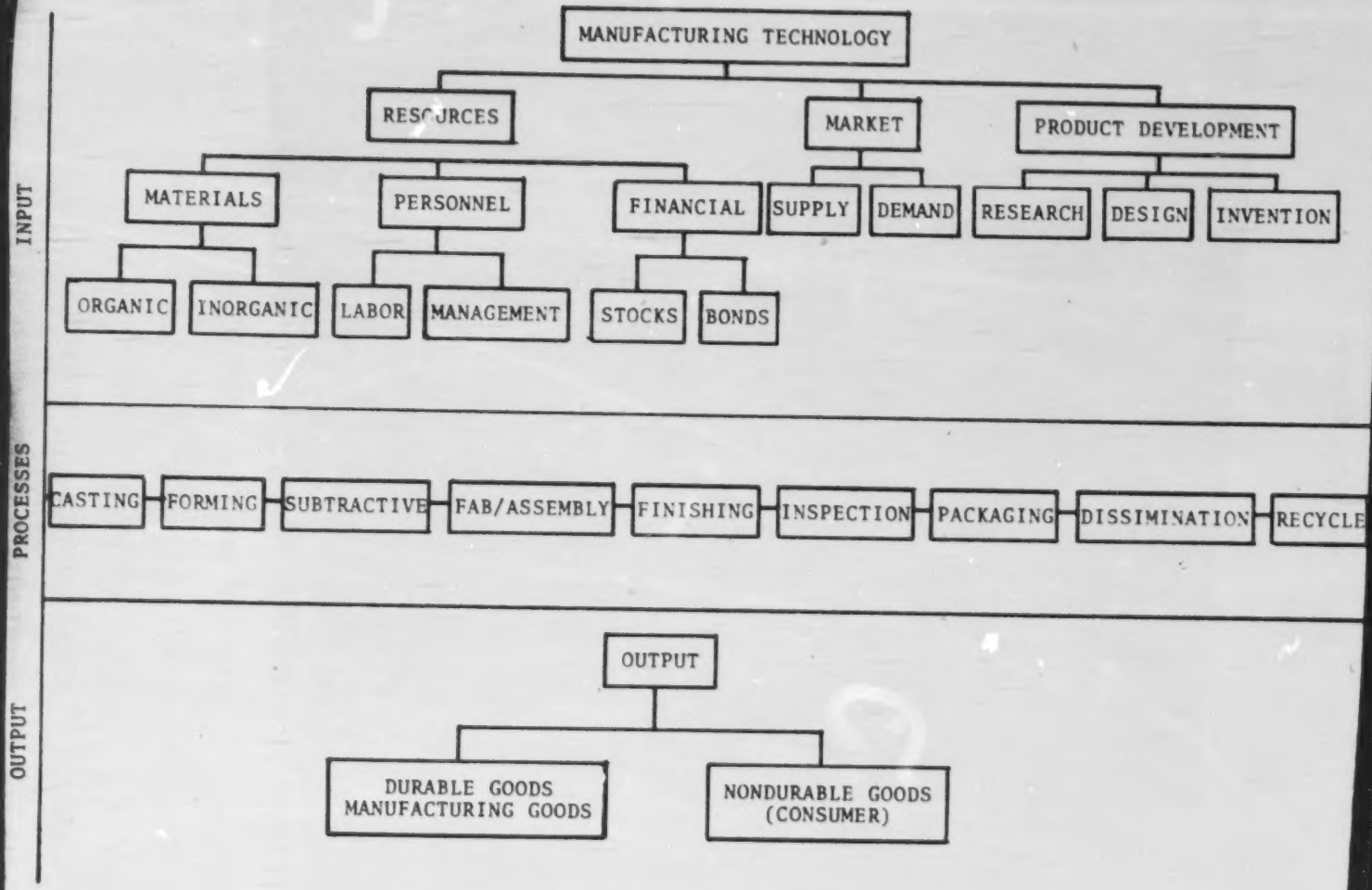
2. The learner will be able to identify the function of pre-processing, processing and post-processing for Manufacturing Technology.

OUTPUT

1. Level 1 Concept III

   The learner will be able to identify two elements of manufacturing output.

2. The learner will be able to identify the function of and limitations of manufactured products.


MANUFACTURING TECHNOLOGY
RESOURCES
MARKET
PRODUCT DEVELOPMENT
MATERIALS
PERSONNEL
FINANCIAL
SUPPLY
DEMAND
RESEARCH
DESIGN
INVENTION
ORGANIC
INORGANIC
LABOR
MANAGEMENT
STOCKS
BONDS
INPUT
CASTING
FORMING
SUBTRACTIVE
FAB/ASSEMBLY
FINISHING
INSPECTION
PACKAGING
DISSIMINATION
RECYCLE
PROCESSES
OUTPUT
OUTPUT
DURABLE GOODS
MANUFACTURING GOODS
NONDURABLE GOODS
(CONSUMER)

Manufacturing Technology Cluster

Preliminary Elements:

RATIONALE 1

OBJECTIVES 2

GUIDELINES FOR IMPLEMENTATION 4

CURRICULUM STRUCTURE 6

TAXONOMETRIC STRUCTURE 7

BODY OF KNOWLEDGE 8

LIST OF MAJOR UNITS 14

Major Units:

UNIT I	STRUCTURE OF INDUSTRY	1.1
UNIT II	ELEMENTS OF MANUFACTURING	2.1
UNIT III	MASS PRODUCTION AND AUTOMATION	3.1
UNIT IV	PRIMARY METALS INDUSTRY	4.1
UNIT V	CASTING METAL	5.1
UNIT VI	FORGING AND FORMING METAL	6.1
UNIT VII	MEASURING AND LAYOUT (ENGLISH AND/OR METRIC)	7.1
UNIT VIII	MACHINING AND FINISHING METAL	8.1
UNIT IX	FASTENING AND FINISHING METAL	9.1
UNIT X	LUMBERING AND FOREST PRODUCTS	10.1
UNIT XI	CUTTING AND SHAPING WOOD	11.1
UNIT XII	ASSEMBLING AND FINISHING WOOD	12.1
UNIT XIII	PLASTIC MATERIAL AND PROCESSES	13.1
UNIT XIV	OPPORTUNITIES IN MANUFACTURING	14.1

Resources:

A. - BIBLIOGRAPHY

B. - VISUAL AIDS SOURCES

C. - EQUIPMENT

SAMPLE STUDENT COMPETENCIES AND ACTIVITY SHEET

UNIT NO. I	SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
1.00	STRUCTURE OF MANUFACTURING THE STUDENT WILL BE ABLE TO:	
1.10	A. Identify the four manufacturing elements.	A1. The students will discuss the four essentials of specific manufacturing industries. Examples: the auto industry, the boat industry and the sugarbeet industry.
1.20	A. Demonstrate the principle of supply and demand.	A1. The student will state how the demand for a product affects the supply. Example: the price of coffee, sugar, gasoline.
1.30	A. Name and explain the three forms of ownership.	A1. The student will discuss the advantages and disadvantages of the different types of ownership. Example: tax benefits, financing, legal implications (have a local lawyer talk to class).
1.40	A. Demonstrate the relationship between labor and management.	A1. The student will identify several planning, organizing, and controlling functions of management for manufacturing. Example: Assign students to management role-playing. A2. The student will identify several of the working activities necessary for manufacturing a specified product. Example: Assign students to labor role-playing.

SUB-SECTION FOUR

Construction Technology Cluster

RATIONALE: The development of the Construction Technology cluster has evolved from the industrial technology body of knowledge.

The purpose of studies of this construction technology cluster is to provide students, through activity-oriented instruction, with; the broad context of the construction industry; selected practices in pre-construction, construction and post-construction. Studies within this cluster are complimented by student conducted laboratory activities which emphasize the technical aspects, environmental, safety, and career aspects of this cluster.

More specifically, the educational purposes of this instructional cluster are to provide students with:

1. The broad concept of construction technology within the context of the industrial technology.
2. Selected practices in pre-construction.
3. An understanding of construction activity and utilization of tools and materials.
4. An application of the construction methods.
5. The significance of self-realization and self-activating behaviors for future learning in professional or technical fields.

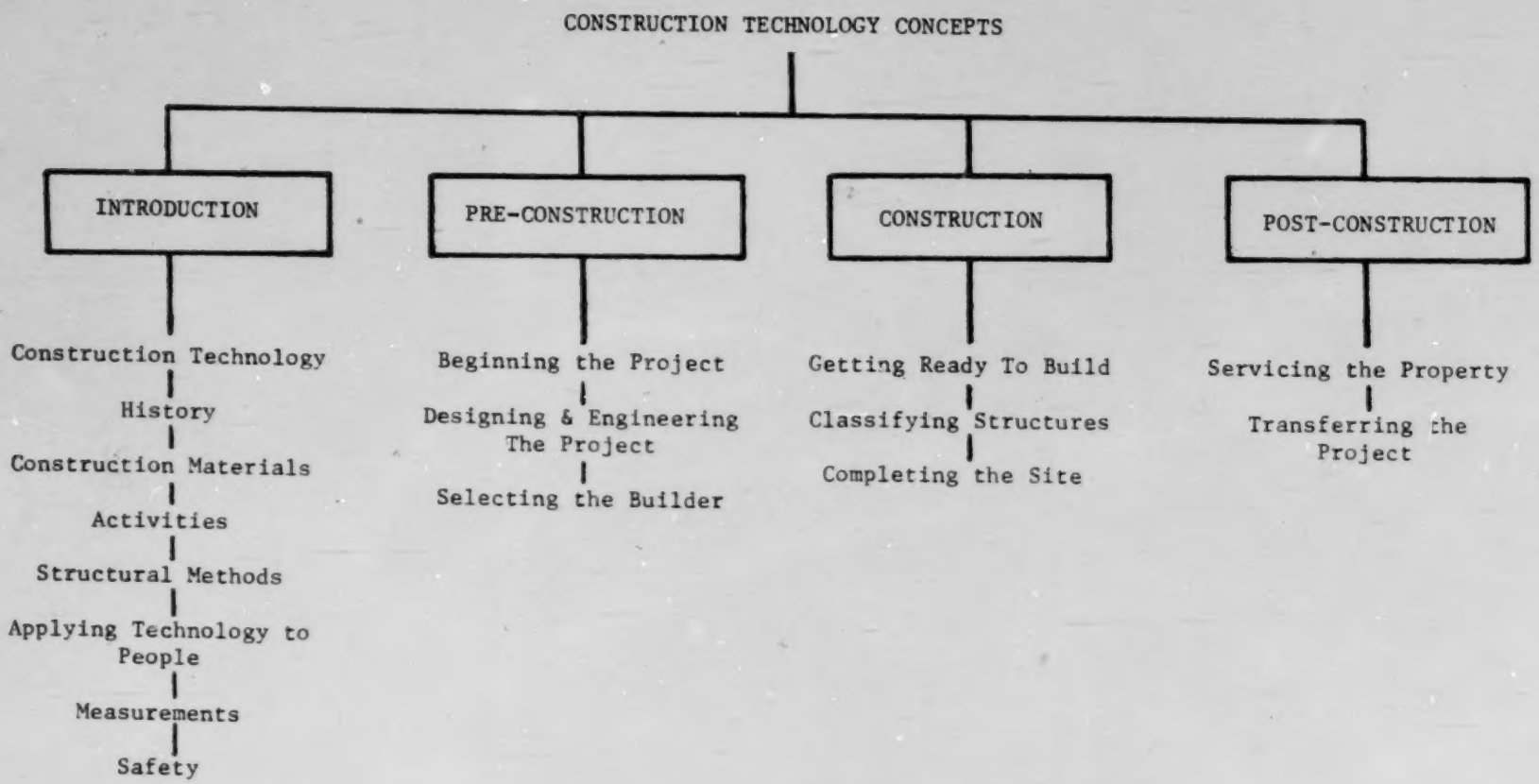
OBJECTIVES: Primary objectives of Construction Technology are to:

1. Place Construction Technology in the broad context of industrial technology.
2. Provide selected Construction Technology activities for the development of attitudes, appreciation, and understanding in an introduction to construction, pre-construction, construction,

and post-construction.

3. Develop an awareness of self-realization and generate self-activating behaviors.
4. Develop an understanding of construction activities and the tools and materials utilized in their construction.
5. Relate the activities of construction technology to local, state, and national developments.
6. Utilize knowledge of past, present and future techniques outside the classroom.

TAXONOMETRIC STRUCTURE



Construction Technology Cluster

Preliminary Elements:

RATIONALE 1

OBJECTIVES 1

GUIDELINES FOR IMPLEMENTATION 3

TAXONOMETRIC STRUCTURE 5

BODY OF KNOWLEDGE 6

LIST OF MAJOR UNITS 9

Major Units:

UNIT I INTRODUCTION TO CONSTRUCTION TECHNOLOGY 1.1

UNIT II PRE-CONSTRUCTION 2.1

UNIT III CONSTRUCTION 3.1

UNIT IV POST-CONSTRUCTION 4.1

Resources:

A. - BIBLIOGRAPHY

B. - VISUAL AIDS SOURCES

C. - MATERIALS AND EQUIPMENT

SAMPLE STUDENT COMPETENCIES AND ACTIVITY SHEET

UNIT NO. I	SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
1.00	INTRODUCTION TO CONSTRUCTION TECHNOLOGY THE STUDENT WILL BE ABLE TO:	
1.10	A. Give advantages of organization vs no organization.	A1. Divide the class in groups of five each holding a defined position. A2. Hand out class organization practice sheets (Fig. 4.2, Jack M. Landers, Construction Instructor's Guide and Key, Page 10).
	B. Recite the qualifications and duties of: 1. Shop Foreman 2. Recorder 3. Equipment Supervisor 4. Supply Clerk 5. Safety-grievance person	B1. Allow each group to choose its five positions. B2. Have class fill out class organization chart. B3. Orally quiz the individuals about their new role in construction organization.
1.20	A. Identify the post and lintel, arch and truss as a structural system.	A1. Assemble the post and lintel model, assemble blocks to form an arch, and assemble the truss section.
	B. Describe the effects of a downward force on the post and lintel, arch and truss systems.	B1. Observe that weaker material used for the lintel requires that posts be set close together.
	C. Identify the nature of supporting loads inherent in building.	C1. Observe that the arch will withstand downward thrust only equal to the massive weight of the supporting posts, and observe that the truss is a very stable design.

SUB-SECTION FIVE

Energy/Power Technology Cluster

RATIONALE: The purpose of studies in the energy/power cluster area is to develop a realization, through activity-oriented instruction, that the six forms of energy: their availability, conversion, efficient usage, and future development are essential to man's existance. Studies within this cluster area are complimented with both manipulative and experimental student-conducted activities, or teacher demonstrations, which emphasize the technical phenomenon involved. These studies impress upon the student the socioeconomic and environmental impact of energy usage and the safety, efficiency, and occupational aspects inherent in the energy/power field.

The seven major units of the study cluster effectively cover most energy/power concepts at the middle school level. Four of the seven major units follow a pattern of identifying subconcepts in accord with the six forms of energy (chemical, electrical, light, mechanical, nuclear, and thermal) which are initially encountered in unit three. Thus, a broad coverage of energy/power, including "alternative sources for the future," is made possible without specifying any particular form as more applicable to the past, present, or future. The separation of "sources" from "forms" in the third unit is significant because, though most of the "forms" have been used extensively throughout man's history, no form is presently scarce. Some "sources" of several "forms" are becoming more scarce, thereby necessitating extensive research regarding future sources.

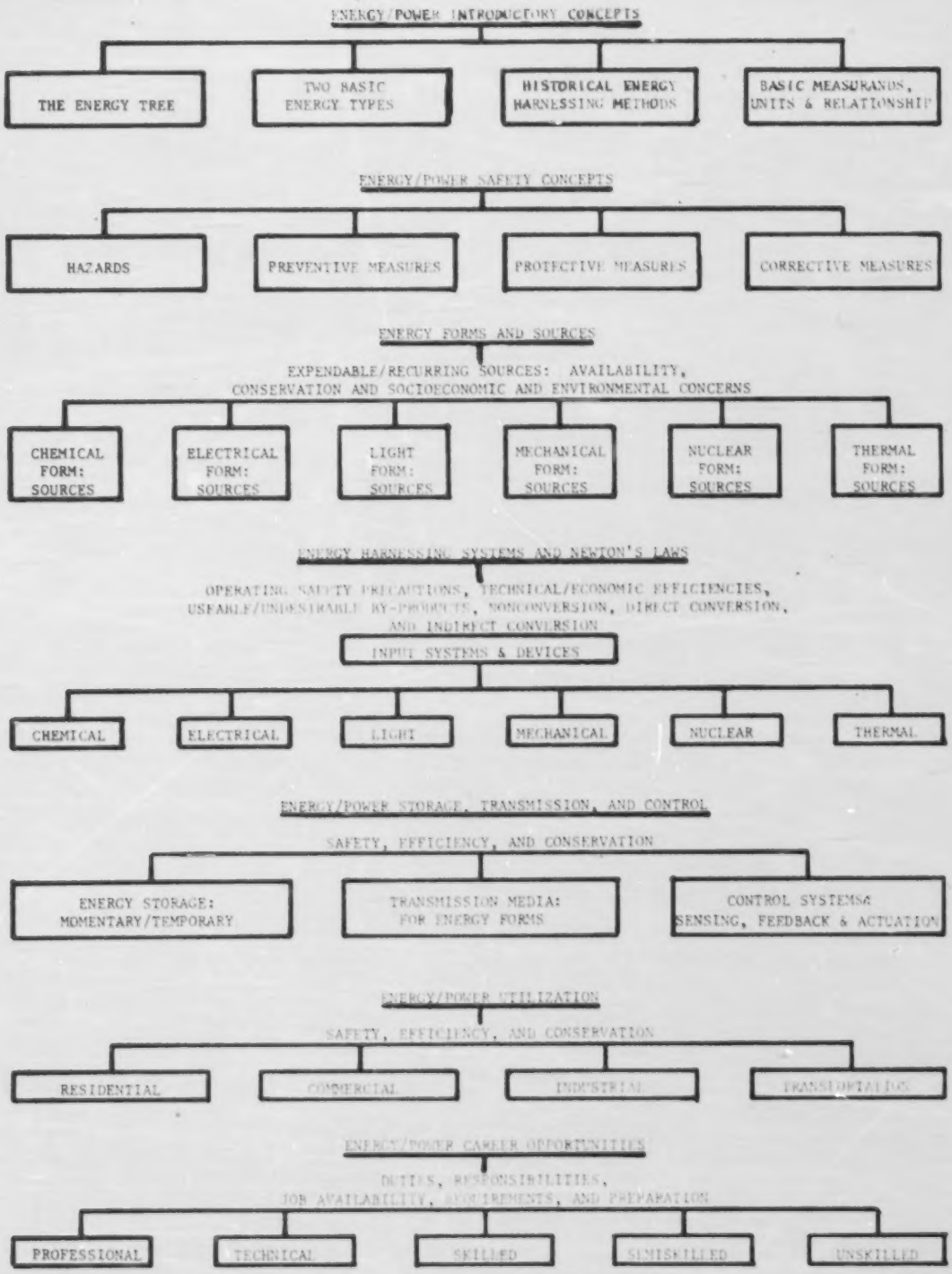
OBJECTIVES: The general objectives of the energy/power technology cluster are:

1. To develop an insight and understanding of the broad energy/power field and its importance to our society.

2. To discover and develop attitudes, interests, and individual potentials related to the energy/power industry through problem solving using tools and products of industry.
3. To develop career awareness through pre-vocational experiences and information relating to the world of energy and power.
4. To facilitate wise utilization of energy and power as a consumer.
5. To develop abilities for the safe and proper use of energy and associated substances, materials, and/or devices.

ENERGY/POWER TECHNOLOGY

TAXONOMETRIC STRUCTURE



Energy/Power Technology Cluster

Preliminary Elements:

RATIONALE 1

OBJECTIVES 2

GUIDELINES FOR IMPLEMENTATION 3

TAXONOMETRIC STRUCTURE 5

BODY OF KNOWLEDGE 6

LIST OF MAJOR UNITS 15

Major Units:

UNIT I ENERGY/POWER INTRODUCTORY CONCEPTS 1.1

UNIT II ENERGY/POWER SAFETY CONCEPTS 2.1

UNIT III ENERGY FORMS AND SOURCES 3.1

UNIT IV ENERGY HARNESSING SYSTEMS AND NEWTON'S LAWS . . . 4.1

UNIT V ENERGY/POWER TRANSMISSION AND CONTROL 5.1

UNIT VI ENERGY/POWER UTILIZATION 6.1

UNIT VII ENERGY/POWER CAREER OPPORTUNITIES 7.1

Resources:

A. - BIBLIOGRAPHY

B. - VISUAL AIDS SOURCES

C. - SAMPLE STUDENT ACTIVITY REPORT FORM

SAMPLE STUDENT COMPETENCIES AND ACTIVITY SHEET

UNIT NO. I	SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
1.00	ENERGY/POWER INTRODUCTORY CONCEPTS THE STUDENT WILL BE ABLE TO:	
1.10	A. Identify, list and describe the natural progressions of energy from the sun into other forms of energy.	A1. Refer to A. at left. A2. Demonstrate the transformation of energy. Examples: Draw chart of energy tree with sun as origin.
1.20	A. Identify, list and describe the two basic types of energy.	A1. Identify examples of kinetic and potential energy in your lab, home, community, etc. A2. Discuss the law of conservation of energy. Examples: Demonstrate using pendulum. Drive nail and note temperature change of head. Light incandescent bulb and note temperature increase. (Approximately 10 percent of electrical energy is converted to light energy and the remainder is converted to thermal energy.) A3. How friction interacts with the law of conservation of energy and how this effects the efficiency of a machine. Examples: Spin bicycle wheel, set rim brakes, and sense temperature of rim.

Summary/Conclusions

The curriculum design process is a logical and straightforward system that is universally accepted in the educational profession. Some of the terminology varies in different settings but the overall scheme is about the same.

The major steps we must go through are: Identify and determine the need for offering the program. This is referred to as determining the philosophical rationale for a program and/or course. It answers the question "why". The North Dakota curriculum project committee established a program rationale with specific goals prior to the identification of content.

The second phase involved the clusterization of human technological endeavors as a basis for the development of specific areas of study. Those identified included: (1) a broad overview of industry and technology; (2) graphic communication; (3) manufacturing technology; (4) construction technology; and (5) energy/power technology. At this point,the analysis process was undertaken to structure the bodies of knowledge for each of the clusters. This level of curriculum development was based on the conceptual analysis approach. The prime purpose of this activity was to classify the major elements on a hierarchy format.

Once it was determined what is to be taught, the program was articulated to give meaning by identifying levels of instruction and some type of organizational strategy.. Major units were identified for each area. These were than placed in proper sequential order for instructional purposes.

The last phase included the preparation of unit outlines including:

(1) unit objectives; (2) content; (3) selected student competencies; (4) selected learning activities; and (5) resource and/or reference material. The intent of this phase was not to provide a complete set of instructional materials, but rather to provide a structure that a classroom teacher could use to develop his/her instructional materials necessary for day-to-day operation of a program.

The 500 page curriculum guide was developed to aid industrial arts teachers in presenting curriculum content based upon technology. It suggests a system of approach to teaching and introduces ways for the teacher to implement the indentified content through instructional procedures developed and proven by curriculum research.

The results of this curriculum effort is contigent upon the realization that it is a directional device. A guide is only one element of a program of curriculum improvement. It must be emphasized that effective utilization of the guide will depend upon whether the teacher is prepared to use the materials.

Recommendations

It is recommended that the following guidelines be adhered to in the implementation of the guide and further development to meet local needs.

1. Teachers must be willing to accept the concept of change in industrial arts education.
2. The teacher must view the developed guide as a system approach to curriculum development. The implementation should be the "whole" guide rather than "part" to maintain its intended purpose.
3. The level I curriculum is recommended for grades seven, eight

and nine or first three years of program offerings in a given school.

4. The guide must be continually evaluated and up-graded to avoid obsolesence of content.
5. The guide is designed to provide industrial arts teachers with a sense of direction. Teachers must take the initiative to develop specific learning materials that will meet individual student needs.
6. Similar curriculum efforts should be devoted to the level II, upper division industrial arts program on a State-wide basis.

BIBLIOGRAPHY

A Guide to Improving in Industrial Arts, American Vocational Association, Washington, D. C., 1968.

Bloom, Benjamin S., Human Characteristics and School Learning, McGraw-Hill Book Company, New York, New York, 1976.

Career Education: New Perspectives for Industrial Arts, American Vocational Association, Washington, D. C., 1974.

Guides on Industrial Arts, (American industry, construction, manufacturing, graphic communications), Department of Education, Tallahassee, Florida, 1973.

Industrial Arts: A Means of Preparing Youth to Understand and Contribute to Our Industrial-Technological Society, American Industrial Arts Association, Washington, D. C., January, 1976.

Industrial Arts in Senior High Schools, ACIATE, 22nd yearbook, McKnight and McKnight Publishing Company, Bloomington, Illinois, 1973.

Industrial Education in Minnesota - A Guide for Elementary and Secondary Program Development, Minnesota State Department of Education, 1974.

Kauffman, D. L. Jr., Teaching the Future--A Guide to Future-oriented Education, ETC Publications, Palm Springs, 1976.

Learning For Tomorrow: The Role of the Future in Education, (Edited by Alvin Toffler), Random House Publishing Co., New York, New York, 1974.

Olson, Delmar W., Industrial Arts and Technology, Prentice-Hall, Englewood Cliffs, New Jersey, 1963.

Pierson, M. J., Philosophical Base for Industrial Arts, Texas Industrial Arts Curriculum Study, 1974.

The Conceptual Base for Industrial Education Project, (3 cluster guides), The Kansas State Department of Education, 1974.

The Iowa Guide for Curriculum Improvement in Industrial Arts, K-12, 1975.

The Rockwell Power Tool Instructor, "Guidelines for Industrial Arts in Career Education," Pittsburgh, PA, Volume 21, No. 1, 1974.

The Secondary Exploration of Technology Project, (cluster guides on power conversion and transmission systems, industrial communications systems and material analysis and processing systems), School of Technology, Kansas State College, Pittsburg, Kansas, 1974.

The Wisconsin Guide to Local Curriculum Improvement in Industrial Education, K-12, Wisconsin State Department of Public Instruction, 1974.

APPENDIX

Dear

Our concern for the curriculum of our schools prompts us all to continually seek ways to assess "what is" and identify ways to improve the educational activities and experiences now provided. Recognition of the schools' efforts to develop students' understanding of the elements of industry and technology has prompted the development of a North Dakota State Curriculum Guide for Industrial Arts education.

The early involvement and commitment of representatives of the North Dakota Industrial Arts Association and State Curriculum Committee comprised of secondary school industrial arts teachers and teacher educators led to the development of a Draft Copy of the Industrial Arts Curriculum Guide in June of 1976.

The draft copy has been reviewed by thirty-two industrial arts teachers and was field tested through the eight 1976-77 pilot schools. This was important in the development of a curriculum guide for the purposes of assessing the draft copy prior to the development of the final Industrial Arts Curriculum Guide for secondary school programs in North Dakota.

Since you have been granted a copy of the curriculum guide during this current school year, we would like to have you complete the enclosed questionnaire. Your input is essential and will be used by the writing team who have been selected to re-write the draft copy during the first week in June, 1977. Our goal is to have the final copy ready by teachers convention next fall.

The committee realizes that numerous changes will have to be made to revise the draft copy before a final copy goes to press this summer. We therefore solicit your responses to each of the questions on the enclosed questionnaire to aid the curriculum guide revision committee.

The completed questionnaire should be returned to me by May 24, 1977.

Sincerely,

Dr. Myron Bender
Department of Industrial Technology
University of North Dakota
Grand Forks, North Dakota 58202

MB/ar

Dear

The purpose of this letter is to inform you that the North Dakota State Board for Vocational Education has funded a project to re-write the Draft Copy of the North Dakota Industrial Arts Curriculum Guide for secondary schools. Also, you have been selected to be invited to participate in the re-writing session to be held on the campus of Valley City State College on June 1, 2, & 3, 1977.

I realize that the above dates are not convenient with everyone asked to participate, but was selected as the best of the dates considered at an organizational meeting held on March 23, 1977. We hope that you can make the necessary arrangements to be present at 9:00 A.M. on June 1, 1977.

The criteria applied in the selection of participants for the re-writing session incorporated a number of factors that the members present at the organizational meeting felt were important. Some of these are:

1. Members who were participants in the writing of the original curriculum guide (draft copy) last June (1976).

2. Members who attended EPDA Workshops on curriculum development over the past two years.

3. Members who conducted successful industrial arts pilot projects at the secondary level during the 1976-77 school term.

4. Members who know what the national trends are in the industrial arts curriculum area.

5. Members who are genuinely interested in advancing industrial arts education in the State of North Dakota.

Congratulations for meeting the above criteria to qualify as a participant in the three day re-writing session. I hope that you will be able to accept the challange.

Each of the ten secondary school classroom participants will be reimbursed in the following manner.

1. Mileage to and from meeting

2. Meals, $10.00 per day for three days

3. Lodging ($3.00 per night at dormitory)

4. Salary ($50.00 per day for three days)

We do encourage you to share rides, where possible, with other participants to cut down on mileage expenses.

Please let me know by May 11th whether it is possible for you to participate in the re-writing session by completing the following and return it prior to May 11, 1977.

Sincerely,

Myron Bender
Project Director

MB/ar

Enclosure

NAME _____ TELEPHONE # _____

	CHECK
1. Yes, I will be present on June 1, 2, & 3 at 9:00 A.M.	_____
2. No, I cannot be present, please select alternate.	_____

3. Need lodging on May 31 ___; June 1 ___; June 2 ___; and June 3 ___.

4. I will bring my wife ___; Family ___.

Total number for which housing is requested. ____

Mail to: Dr. Myron Bender
RCU Project Director
Department of Industrial Technology
University of North Dakota
Grand Forks, North Dakota 58202

List of Participants

Insights into Industry and Technology -	Jerome Wisnewski Lidgerwood High School
	Eddie Poehls * Tolna High School
	Don Mugan (Consultant) Valley City State College
Graphic Communication -	Dean Serr Magic City Campus, Minot
	Erwin Van Veldhuizen * Dickinson High School
	Clem Gruen (Constultant) Valley City State College
Manufacturing -	John Olson * Enderlin High School
	Bert Egstad Valley Junior High School, Grand Forks
	Ray Podell (Consultant) Department of Industrial Technology University of North Dakota
Construction -	George Kovash Drayton High School
	Neil Heringer * McKenzie County High School Watford City, ND
	L. R. Eickhoff (Consultant) Department of Industrial Technology University of North Dakota
Energy/Power -	Kelly Moldenhauer * Sheyenne High School
	Rodney Lembke Hazelton - Moffitt High School
	Herbert Auer (Constultant) Department of Industrial Technology University of North Dakota
	Richard Bushaw (Consultant) Valley City State College

* Instructors who had pilot projects in their schools for the 1976-77 academic year.

NORTH DAKOTA INDUSTRIAL ARTS CURRICULUM GUIDE
Survey Questionnaire

Name: _____

School: _____

Address: _____

Office Telephone # _____

Directions:

Please answer each of the following questions as completely as possible concerning the various elements incorporated in the Draft Copy of the North Dakota Industrial Arts Curriculum Guide, 1976. Your responses are vital to the rewriting team in June to insure that the Final Copy of the N.D. Industrial Arts Curriculum Guide will be an asset to secondary school industrial arts teachers in developing and improving educational programs in the future.

Part I

1. Do you agree or disagree that a curriculum guide should provide a framework for local curricula development and thus avoid prescribing specific content and methodology?

2. Do you believe that the curriculum structure (a. Insights into Industry Technology; b. Graphic Communications; c. Manufacturing; d. Construction; and e. Energy and Power) is appropriate for the exploratory level of industrial arts?

3. Do you believe that the general format of the draft copy is appropriate and easy to use? If not, do you have any suggestions as to how it can be improved?

4. The draft copy contains a list of major units for each of the five cluster areas. Can you think of any other units that should be added? Or eliminated?

5. Do you feel that a section entitled, "Guidelines for Implementation" (like the one on pp. 6 & 7 of the manufacturing part) is essential? Also, should this section be expanded?

6. Each unit within each cluster area contains "selected student competencies and coded "sample learning activities." Does this provide adequate information for student activities? Suggestions.

7. Would you like to see more selected student activity sheets incorporated? If so, would one student laboratory activity sheet per each of the major units be helpful?

8. Please give your overall evaluation of the draft copy of the curriculum guide followed by suggestions for improvement in addition to what has been included in questions 1-7.

This portion to be completed by those teachers who conducted pilot projects during the 1976-77 school term.

1. Which cluster area did you teach?

   (a) Insights into Industry and Technology _____
   (b) Graphic Communications _____
   (c) Manufacturing _____
   (d) Construction _____
   (e) Energy/Power _____

2. What problems and successes did you encounter in implementing portions or all of the draft copy of the curriculum guide?

   Equipment and Budget:

   Resources (books, etc.):

   Facilities (space):

   Student Motivation:

   Laboratory Activities:

   School & Community Support:

3. Please list any recommendations you feel the re-writing team should consider in the development of the final copy of a state curriculum guide.

RCU Industrial Arts Curriculum Project
Valley City, North Dakota
June 1, 2, & 3, 1977

Agenda:

Wednesday
June 1 ---------- 9:00 AM Introduction, Orientation, and Registration.
9:30 AM Review of Survey Data
10:00 AM Discussion of Pilot Project Programs
10:30 AM Review of Draft Copy Format
(a) cover design
(b) nature of finished product (length, etc.)
(c) foreward and acknowledgements
(d) rationale for industrial arts
(e) program scope and sequence
(f) goals of industrial arts
(g) cluster chart
(h) learning experiences

11:15 AM Review of Cluster Areas and Elements
(a) rationale
(b) objectives
(c) taxonometric structure
(d) body of knowledge
(e) list of major units

11:45 AM Summary/Discussion

12:00 AM Lunch

1:00 PM Orientation and assignments
1:10 PM Review of each cluster area by small groups
2:00 PM Large group discussion reported by cluster groups
changes/deletions/recommendations
2:40 PM Orientation to Student Activity Sheets
(a) nature
(b) format and elements
- number and title of activity related to unit
- students name and due date
- introduction
- objectives
- procedure(illustrated)
- materials needed
- criteria for completed activity
- related information/references

Cont. Page 2

3:30 PM Identification of Activity sheet titles.

4:45 PM Small group summary of activities reported to large group

5:15 PM Adjournment

5:30 PM Golf/other recreation/sleep

Thursday
June 2 ----------8:00 AM Writing of activity sheets by cluster groups.

12:00 AM Lunch

1:00 PM Writing of activity sheets continued.

5:00 PM Adjournment
Recreation or writing

Friday
June 3 ----------8:00 AM Progress and problem reports by small groups

9:00 AM Revision and writing of activity assignments continued.

12:00 AM Lunch

1:00 PM Discussion of final copy large group

2:00 PM Final revisions by cluster areas
- rationale
- objectives
- taxonometric structure
- body of knowledge
- list of major units
- content of units
- student activity sheets
- instructional resources

3:30 PM Small group final oral report.

4:00 PM Discussion/Summary

4:30 PM Details/Expenses/etc.

4:45 PM Adjournment -- Thank you for sticking it out until we adjourned.

STUDENT ACTIVITY SHEET

NAME _____ DUE DATE _____

Number and Title of Unit: _____

(A) Introduction:

(B) Objective(s):

(C) Procedures:

(D) Materials Needed:

(E) Criteria for Completed Activity:

(F) Related Information: